3.23 Noise and Vibration

This section addresses the noise and vibration impacts of the Proposed Action and alternatives. It includes a description of the area of analysis, the affected environment, and existing conditions. This section also describes the criteria used to define and determine noise and vibration impact significance and the assessment methods. The potential impact from noise and vibration are evaluated for each alternative, and possible mitigation measures are listed. Appendix U describes basic noise and vibration concepts, detailed methods and calculations, and modeling results.

3.23.1 Area of Analysis

The area of analysis for noise and vibration effects associated with the Klamath Hydroelectric Settlement Agreement (KHSA) includes areas near the Four Facilities and the haul routes in Klamath and Jackson Counties, Oregon, and Siskiyou and Shasta Counties, California. Figure 3.23-1 shows the locations of the Four Facilities and haul routes. The area of analysis for the Klamath Basin Restoration Agreement (KBRA) constitutes the entirety of the Klamath Basin.

3.23.2 Regulatory Framework

Noise and Vibration levels in the area of analysis are regulated by local laws and policies. There are no federal or state regulations applicable to noise and vibration levels from construction activity in the area of analysis.

3.23.2.1 Local Authorities and Regulations

- Siskiyou County General Plan Noise Element (1978)

The Siskiyou County General Plan Noise Element contains criteria for maximum allowable noise levels from construction equipment. Table 3.23-1 lists the maximum allowable noise levels in A-weighted decibels (dBA) for construction equipment applicable to the Proposed Action. There are no other applicable state or local regulatory levels for noise or vibration in the area of analysis.

Although the Proposed Action does not involve highway construction, federal and state highway traffic noise criteria provide a basis for analyzing project traffic noise impacts. The Federal Highway Administration (FHWA) requires highway agencies to define a "substantial" noise increase as an increase of 5 to 15 dBA over existing noise levels (23 CFR Part 772). The California Department of Transportation (Caltrans) defines "substantial" as a predicted increase greater than or equal to 12 dBA over existing 1-hour equivalent noise levels (Leq) (Caltrans 2006). The Oregon Department of Transportation (ODOT) defines substantial noise increase as greater than or equal to 10 dBA above the existing 1-hour Leq (ODOT 2009).

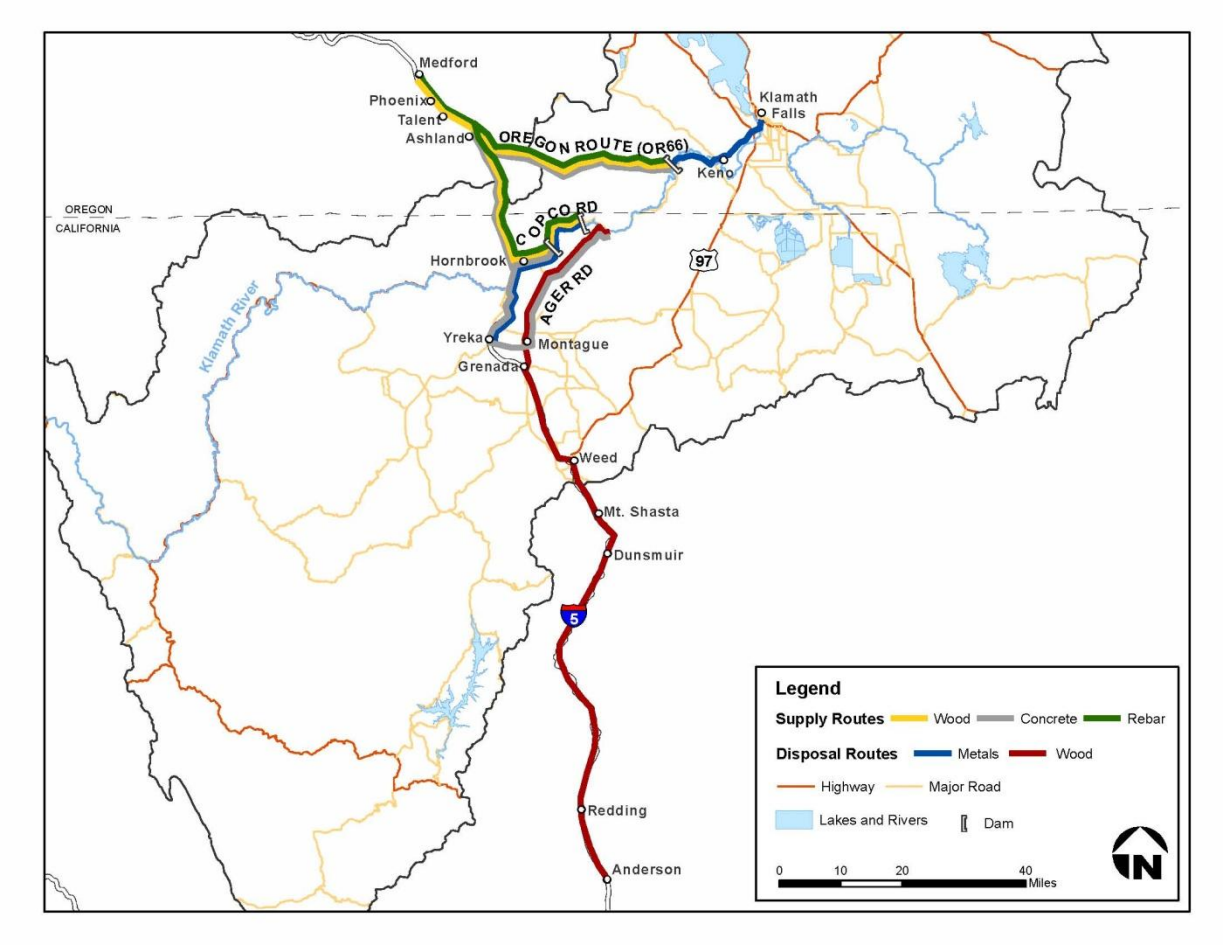

Figure 3.23-1. Primary Haul Routes From Dam Sites

Table 3.23-1. Maximum Allowable Noise Levels from Construction Equipment in Siskiyou County, CA

Equipment Type	Peak Noise Level (dBA at 50 feet)[1]
Compressors	81
Concrete Mixers	81
Concrete Pumps	81
Cranes	81
Dozers	81
Front Loaders	81
Generators	81
Pneumatic Tools	86
Pumps	81
Tractors	81
Trucks	81

Source: Siskiyou County 1978.

Notes:

[1]*Maximum allowable noise levels from construction equipment at 100 ft from Siskiyou County's General Plan converted to noise levels at 50 ft.*

3.23.3 Existing Conditions/Affected Environment

The Lead Agencies identified noise-sensitive human receptor locations (i.e. residences) based on a review of current topographic, aerial, and land use maps. Existing outdoor ambient noise levels at affected sensitive receptor locations were estimated using published average ambient noise levels for various land uses. Siskiyou County presents average noise levels for various land use categories in the Noise Element of their General Plan (Siskiyou County 1978). However these median ambient noise levels for different land use categories were developed based on a one-time field survey in the 1970s and none of the measurements were taken in the project area. Therefore, the Lead Agencies used average daytime L_{eq} and nighttime outdoor L_{eq} noise levels from U.S. Environmental Protection Agency's (USEPA's) *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety* (1974) to estimate ambient noise levels at selected receptor locations. Noise levels for rural residential areas in the USEPA document are lower than the levels presented in the Siskiyou County General Plan; it is more conservative to analyze the impacts using the USEPA levels. Because noise and vibration impacts would not occur without a receptor, the Affected Environment includes the rural residential areas and wildlife nesting areas closest to the proposed construction sites. The following paragraphs describe the sensitive receptors in the Affected Environment.

3.23.3.1 Existing Noise Levels near Construction Sites

The land surrounding the J.C. Boyle Dam is primarily undeveloped, and land use is primarily recreational. Recreational sites would be closed to visitors during construction and demolition activities; therefore, no impact analysis was conducted for campgrounds. No residential areas are within a mile of the dam. Because of this, noise and vibration impacts to humans would not occur from construction and deconstruction activities at the J.C. Boyle Dam. Trucks from J.C. Boyle Dam would most likely travel on Oregon Route 66 (OR66), approximately 2,500 feet west of the dam, reached via Topsy Grade Road to access Interstate 5 (I-5) or U.S. Route 97 (US97). Figure 3.23-2 shows the locations of J.C. Boyle Dam, Topsy Campground, Topsy Recreation Site, and Topsy Grade Road.

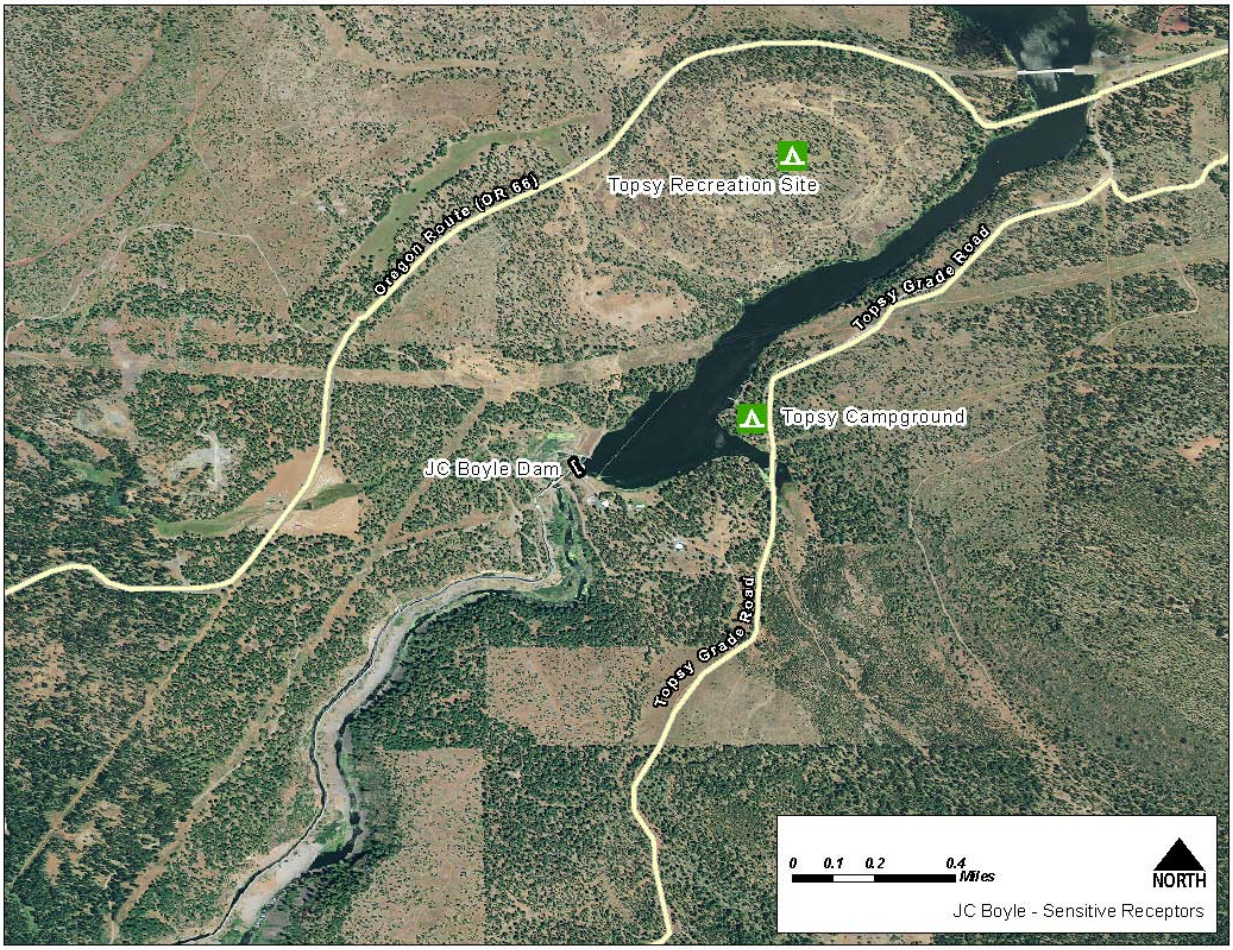

Figure 3.23-2. J.C. Boyle Noise Receptors (Closest Receptors to J.C. Boyle Dam)

Copco 1 Dam and Powerhouse are approximately 2,200 feet west of a rural residential area (see Figure 3.23-3). Residences on Janice Avenue are the closest sensitive receptors, and the estimated existing daytime and nighttime outdoor Leq, based on the USEPA information as noted above are 40 and 30 dBA, respectively. The 2,200-foot distance between the dam and the receptor would provide 34 decibels (dB) of noise reduction, based on basic noise propagation calculation as described in Appendix U. The line of sight from the dam to the Janice Avenue receptor is blocked by a hill, the top of which is about 60 feet higher in elevation than the top of Copco 1 Dam at the hill's highest point along the line of sight between the dam and the receptor. The terrain may provide up to 5 dB of additional noise attenuation from the construction site to the Janice Avenue receptors. Copco Road and Ager-Beswick Road are the main off-site haul routes from this construction site. The Lead Agencies estimated traffic noise for trucks transporting materials in and out of the Copco 1 Dam and Powerhouse site via Copco Road and Ager-Beswick Road.

Figure 3.23-3. Copco 1 & 2 Noise Receptor (Closest Receptor to Copco 1 and Copco 2 Dams)

The closest sensitive receptor to Copco 2 Dam is the residential area on Janice Avenue described above for Copco 1 Dam. From Copco 2 Dam, the receptor is approximately 3,700 feet to the east. The line of sight from the dam to the receptor is blocked by two hills that have elevations approximately 180 feet higher than the top of the dam. Because of this natural topography surrounding the dam and distance between the dam and the receptor, noise from onsite construction activities at Copco 2 Dam would be reduced by 44 dB. No further analysis was conducted on noise from construction equipment and on-site hauling at Copco 2 Dam. The Lead Agencies estimated traffic noise for trucks transporting materials in and out of Copco 2 Dam via Copco Road and Ager-Beswick Road. Figure 3.23-3 shows the Copco 1 Dam, Copco 1 Powerhouse, and Copco 2 Dam locations as well as the closest sensitive receptor on Janice Avenue.

The Iron Gate Dam area is approximately 1,100 feet east of Copco Road, its main haul route. The closest sensitive receptor to Iron Gate Dam is on Tarpon Drive, approximately 4,500 feet southwest of the dam, as shown on Figure 3.23-4. Based upon the rural residential land use category, the existing daytime outdoor L_{eq} on Tarpon Drive is likely

40 dBA. The existing nighttime outdoor L_{eq} at this receptor is approximately 30 dBA. At its highest point along the line of sight between the receptor and the dam, the hill on river left just upstream of the Fish Hatchery is approximately 20 feet lower in elevation than the top of Iron Gate Dam. At the receptor, the hill would provide up to 3 dBA of noise reduction, in addition to the 43 dBA reduction due to distance from the construction site, for a total reduction of 46 dBA. Although this reduction is greater than that for Copco 2 Dam, there would be nighttime construction activities at Iron Gate Dam which may result in significant impact; the Lead Agencies estimated onsite construction and hauling noise levels.

Figure 3.23-4. Iron Gate Noise Receptors (Closest Receptor to Iron Gate Dam)

Section 3.5, Terrestrial Resources, shows the presence of special-status bird and other animal species near each of the dam sites and describes potential impacts and possible mitigation measures related to noise.

Table 3.23-2 summarizes the existing noise levels for the residential receptors selected to assess the noise and vibration impacts from each construction site. Daytime is defined as hours between 7:00 a.m. and 10:00 p.m., and nighttime is defined as 10:00 p.m. to 7:00 a.m. PacifiCorp's residential properties were assumed to be unoccupied during the transfer of ownership to Reclamation and were not considered in this analysis.

Table 3.23-2. Existing Noise Levels at Residential Receptors Near Construction Sites

Construction Site [1]	Receptor Description	Distance from Construction Site (feet)	Estimated Existing Daytime L_{eq} (dBA)	Estimated Existing Nighttime L_{eq} (dBA)
Copco 1 Dam	Residential Area on Janice Ave, East of Copco 1 Dam.	2,200	40	30
Copco 2 Dam [2]	Residential Area on Janice Ave, East of Copco 1 Dam.	3,700	N/A	N/A
Iron Gate Dam	Residential Area on Tarpon Dr, SW of Iron Gate Dam.	4,500	40	30

Sources: Google Earth; USEPA 1974.

Notes:

[1] There are no applicable receptors at the J.C. Boyle Dam.

[2] Copco 2 Dam was not analyzed for noise impacts because the reduction in noise level due to distance and terrain between the receptor and the construction site would result in less than significant noise increase at the receptor.

Key:

dBA = A-weighted decibels

L_{eq} = 1-hour equivalent noise level

N/A = not applicable

3.23.3.2 Existing Noise Levels along the Haul Routes

The Lead Agencies used the FHWA Traffic Noise Model, Version 2.5 (TNM2.5) to estimate the existing daytime peak hour L_{eqs} along proposed haul routes. Peak-hour traffic was estimated by multiplying the average daily traffic by 10 percent based on a review of Caltrans and ODOT 2009 average daily and peak hourly traffic data (Caltrans 2010; ODOT 2010). Average daily traffic values published by ODOT (2010) and Caltrans (2010) were used to estimate the existing noise levels on OR66, US97, and I-5. Traffic volumes for I-5 between Yreka and Anderson, California are higher than those for north of Yreka; therefore, for conservative analysis, the lower volumes in the northern portion were used for the baseline. Field observations conducted for the preparation of the Klamath Facilities Removal Environmental Impact Statement/Environmental Impact Report (EIS/EIR) provided the basis for estimating existing 1-hr L_{eq} along Topsy Grade Road, Copco Road, and Ager-Beswick Road.

This analysis uses peak-hour noise level results from TNM2.5 for generic receptors 50 and 500 feet from the edge of the road. Fifty feet represents the minimum distance for a receptor along any roadway and 500 feet is the maximum recommended receptor distance for traffic noise models (Caltrans 2006). Table 3.23-3 summarizes the existing peak hour L_{eq} for project haul routes at 50 feet and 500 feet from the edge of the roadway.

Table 3.23-3. Existing Peak Hour L_{eq} Along Proposed Haul and Commute Routes

Haul Route/Commute Segment	Existing Daytime Peak hour L_{eq} (dBA)[1]	
	50 feet	500 feet
Topsy Grade County Road / Ager-Beswick Road	53	42
US97	75	64
OR66	60	49
Copco Road	58	46
I-5: Between Medford, OR and OR66	77	66
I-5: Between OR66 and Yreka, CA	76	66

Source: Caltrans 2010. ODOT 2010. USEPA 1974.

Notes:

[1] Daytime 1-hour L_{eq} estimated by modeling traffic counts using TNM2.5.

Key:

dBA = A-weighted decibels

L_{eq} = 1-hour equivalent noise level

3.23.4 Environmental Consequences

Potential sources of noise from implementation of the Klamath Hydroelectric Settlement Agreement include construction equipment and construction-related traffic noise. Impact determination methods, criteria, and effects determination are presented below.

3.23.4.1 Environmental Effects Determination Methods

This analysis compared the impacts of the Proposed Action and alternatives to the baseline existing conditions. This analysis assumes that no considerable changes in land use would occur in the next 10 years and therefore, existing conditions and the No Action/No Project ambient noise levels would be the same. The Lead Agencies determined noise and vibration levels from construction equipment in the project area and construction-related traffic for each action alternative using the methods described below. A more detailed method description, analysis results, and data supporting the analysis are included in Appendix U.

On-site Construction Noise

The construction impact analysis focused on outdoor receptors in residential areas near the construction sites. Anticipated sources of construction noise include cranes, excavators, loaders, dozers, concrete trucks, water tankers, pick-up trucks, generators, air compressors, and pavement breakers.

Principles and methods described in FHWA's Roadway Construction Noise Model User's Guide (2006) were the basis for predicting noise impacts associated with construction equipment for the action alternatives. Table 3.23-4 presents noise levels of common construction equipment operating at full power (L_{max}) measured 50 feet from the source, the percentage of time the equipment would be operated at full power (usage factor), and the L_{eq} over a single shift (FHWA 2006). For equipment whose L_{max} in the Roadway Construction Noise Model exceeds the maximum allowable noise levels from

construction equipment in the Siskiyou County General Plan Noise Element (1978), the upper limits from Siskiyou County were used.

Table 3.23-4. Construction Operations, Equipment Types, and Their Noise Levels

Equipment Types	Usage Factor	L_{max} at 50 feet (dBA)	L_{eq} at 50 feet (dBA)
Air Compressor	40%	78	74
Backhoe	40%	78	74
Blasting	1%	94	74
Compactor	20%	83	76
Concrete Mixer Truck	40%	79	75
Concrete Pump Truck[1]	20%	81	74
Crane	16%	81	73
Dozers[1]	40%	81	77
Dump Truck	40%	77	73
Excavator	40%	81	77
Front End Loader	40%	79	75
Generator	50%	81	78
Grader	40%	85	81
Jackhammer[1]	20%	81	74
Mounted Impact Hammer (hoe ram)	20%	90	83
Pickup Truck	40%	75	71
Pumps	50%	81	78
Scraper	40%	84	80
Tractor[1]	40%	81	77

Source: FHWA 2006. Siskiyou County 1978.

Notes:

[1] Maximum allowable noise levels from construction equipment at 100 ft from Siskiyou County's General Plan converted to noise levels at 50 ft.

Key:

dBA = A-weighted decibels

L_{eq} = 1-hour equivalent noise level

L_{max} = noise levels of equipment operating at full power

Detailed equipment lists for each phase of construction were not available at the time of this analysis. Therefore, the analysis conservatively assumed that the dam removal phase would involve the greatest amount of construction equipment. Attenuation due to sound travel from the source to the receptor was applied to the combined L_{eq} at 50 feet from all equipment, and the approximate noise level from construction at the receptor was added to existing outdoor ambient levels. Noise levels for each dam were analyzed separately because the facilities are spread out. Other phases, such as road and/or bridge improvement, Yreka pipeline construction, implementation of the interim measures, cofferdam construction, drawdown, and removal of recreational facilities, would cause less noise and vibration impacts than on the peak day.

Vibration from Construction Sites

In addition to producing noise, construction activities have the potential to produce vibration that is annoying to humans and may cause damage to structures. Blasting, drilling, and demolition cause the highest levels of vibration from construction projects. Table 3.23-5 presents the peak particle velocity (PPV) in inches per second (in/sec) and vibration velocity level (L_v) in vibration decibels (VdB) for typical construction equipment (Federal Transit Administration [FTA] 2006). The Lead Agencies applied these levels to each construction site as appropriate and calculated the equivalent PPV and L_v at the receptor. As was done for noise, the PPV and L_v are based on all construction equipment operating simultaneously on peak construction days.

Table 3.23-5 Vibration Levels for Construction Equipment

Equipment Types	PPV at 25 feet (in/sec)	L_v at 25 feet (VdB)
Clam Shovel Drop	0.202	94
Vibratory Roller	0.210	94
Large Bulldozer / Hoe Ram	0.089	87
Caisson Drilling	0.089	87
Loaded Trucks	0.076	86
Jackhammer	0.035	79

Source: FTA 2006.
Key:
in/sec = inches per second
L_v = vibration velocity level
PPV = peak particle velocity
VdB = vibration decibels

Construction-Related Traffic Noise

Transportation noise impacts include noise generated from an increase in local vehicle traffic due to construction workers commuting and trucks hauling waste and construction materials. Details regarding the roadways affected by this Proposed Action are presented in Section 3.22, Traffic and Transportation. Trucks for onsite waste disposal were included in the construction equipment analysis.

Under the Proposed Action, trucks would haul recyclable metal waste to Yreka, California for waste originating in California and to Klamath Falls, Oregon for waste originating in Oregon. Wood waste from Copco 2 Dam would likely be hauled to a hazardous waste landfill in Anderson, California. For construction of fish passages, rebar and wood would be supplied from Medford, Oregon, and concrete would be transported from Yreka, California. The haul routes would likely be I-5, US97, OR66, Copco Road, Ager-Beswick/Ager Road, and Topsy Grade Road. Communities potentially affected by project-related traffic include unincorporated areas of Siskiyou (California) and Klamath (Oregon) Counties and the following cities: Yreka, Montague, Grenada, Weed, Dunsmuir, Mt. Shasta, Redding, and Anderson in California and Klamath Falls, Ashland, Talent, Phoenix, and Medford in Oregon. Figure 3.23-1 shows, for each supplied or removed material type, the haul route and the communities along the haul routes.

Like the trucks, construction workers would commute to the sites using the major highways and roads (I-5, OR66, US97, Copco Road, and Topsy Grade Road). Based on the impact analysis in Section 3.17, Population and Housing, the analysis assumed that workers at facilities in California (Copco 1, Copco 2, and Iron Gate) would commute from Medford, Oregon or Yreka, California and workers at J.C. Boyle Dam would commute from Keno, Oregon and Klamath Falls, Oregon.

This analysis bases the off-site traffic noise impact assessment on the sum of likely existing noise levels near the haul routes, as described in the Affected Environment/ Environmental Setting section, and additional traffic noise from the project. Results from TNM2.5 were used for predicting noise levels 50 feet and 500 feet from roadways. This analysis assumes that off-site hauling to suppliers and landfills would only occur during the daytime. Although the worker commute may not overlap with off-site hauling, the number of cars and trucks from worker commute and hauling were added to the baseline traffic counts for a conservative analysis. Nighttime construction at Copco 1 and Iron Gate would have less impact (i.e., only worker commute) than daytime commute and offsite hauling.

3.23.4.2 Significance Criteria

For the purpose of this analysis, a project action would be significant if it resulted in any the following:

- A greater than 10 dBA increase in the daytime or nighttime outdoor 1-hour L_{eq} at the receptor from on-site construction operations
- A PPV greater than 0.3 in/sec at the receptor
- An L_v greater than 72 VdB at the receptor
- A greater than 12 dBA (in California) or 10 dBA (in Oregon) increase above existing 1-hour L_{eq} for traffic-related noise

The criteria above were based on the characteristics of noise, published studies on vibration effects, and established regulations. Although Siskiyou County does not have local significance criteria for noise and vibration levels, the significance criteria itemized above is expected to provide a conservative analysis of noise and vibration levels. Daytime is defined as the hours between 7:00 am and 10:00 pm, and nighttime is defined as the hours between 10:00 pm to 7:00 am. A 10 dBA increase in noise level is perceived as a doubling of noise (FHWA 2011). A PPV of 0.3 in/sec or greater can damage old residential structures from continuous or frequent vibration sources (Caltrans 2004). The annoyance level for vibration is 72 VdB in residential areas (FTA 2006). Caltrans (2006) and ODOT (2009) define a substantial increase in noise levels from traffic as an increase of 12 dBA or 10 dBA, in California and Oregon, respectively, above existing 1-hour L_{eq}.

3.23.4.3 Effects Determinations

The following sections describe the noise and vibration impacts for each alternative.

Alternative 1: No Action/No Project

The Four Facilities would not be removed and fish passages would not be constructed. This analysis assumes that ambient noise levels under the No Action/No Project Alternative would be the same as existing conditions. **Therefore, implementation of the No Action/No Project Alternative would cause no change from existing conditions from construction noise impacts.**

Several ongoing resource management actions could cause noise and vibration impacts. There may be some noise and vibration effects due to the use of construction equipment throughout the basin associated with ongoing resource management actions, including the Fish Habitat Restoration Program. These activities may include mechanical thinning of vegetation, gravel augmentation, and breaching levees. Although sufficient information is currently not available to estimate noise and vibration impacts, the quantity of equipment required to complete these restoration activities are expected to be less than the required equipment for dam removal and fish ladder construction activities. **Noise and vibration impacts from ongoing resource management actions are therefore assumed to be less than significant.**

Alternative 2: Full Facilities Removal of Four Dams (Proposed Action)

This section summarizes the noise and vibration effects that would be caused by removing the dams, powerhouses, and other associated structures. J.C. Boyle Dam was not analyzed relative to impacts to human receptors because there are no applicable human sensitive receptors within a 1-mile radius. Copco 2 Dam was also not analyzed for human receptor noise impacts because the line of sight between the dam and the receptor is completely blocked by the terrain, and the nearest sensitive receptor is 3,700 feet from the dam. Impacts to special-status bird species identified near J.C. Boyle Dam and Copco 2 Dam are discussed in further detail below, as well as in Section 3.5, Terrestrial Resources. The Proposed Action impacts are expected to occur between January and September 2020 for approximately four to six months during the scheduled peak dam removal at each site. There are no long-term noise and vibration impacts due to the Proposed Action.

Construction Equipment Noise and Vibration

Two shifts of construction workers are expected to carry out deconstruction of Copco 1 and Iron Gate Dams. Both work shifts overlap with daytime (7:00 a.m. to 10:00 p.m.) and nighttime (10:00 p.m. to 7:00 a.m.) existing levels defined in the previous section. The shifts are described further below. Table 3.23-6 lists the predicted average 1-hour L_{eq} at each construction site and receptor, the increase in noise level at the receptor that would occur as a result of the Proposed Action, and the times of day when the significant impact is expected to occur.

Table 3.23-6. Summary of Noise Levels from Deconstruction Activities for the Proposed Action

Location[1]	L_{eq} (dBA)		
	At Construction Site (50 feet)	At Receptor with Proposed Action	Increase in L_{eq} Caused by Proposed Action
Copco 1 Dam			
Daytime[2]	88-91	50-52	10-**12**
Nighttime[3]	88-91	49-52	10-**22**
Iron Gate Dam			
Daytime[2]	91	46	6
Nighttime[3]	91	44-46	6-**14**

Source: FHWA 2006.

Notes:

[1] J.C. Boyle Dam removal was not analyzed because there are no receptors within 1 mile. Copco 2 Dam removal was not analyzed because the line of sight to the closest receptor is completely blocked.

[2] Daytime is defined as between the hours of 7:00 a.m. to 10:00 p.m.

[3] Nighttime is defined as between the hours of 10:00 p.m. to 7:00 a.m.

Key:

dBA = A-weighted decibels

L_{eq} = 1-hour equivalent noise level

Deconstruction activities at the Four Facilities could cause a temporary increase in noise levels at Copco 1 Dam that could affect residents in the area. The predicted shift-period L_{eq} from all construction equipment on a peak construction day at Copco 1 is 91 dBA at 50 feet during the first shift (6:00 a.m. to 3:00 p.m.) and 88 dBA during the second shift (3:00 p.m. to midnight). Attenuation due to distance, topography, and the atmosphere would reduce these construction site L_{eq} by approximately 39 dBA at the nearest receptor. Compared to the daytime (7:00 a.m. to 10:00 p.m.) and nighttime (10:00 p.m. to 7:00 a.m.) existing outdoor noise levels of 40 and 30 dBA, the resulting increases range from less than 10 to 22 dBA, depending on the time of day. The first shift exceeds the significance criteria at all times because of the high source noise level. The second shift only exceeds the significance criteria after 10:00 p.m. when the background noise levels are expected to be very low. **This increase in outdoor noise levels would have a temporary significant noise impact on the residential area near Copco 1 Dam. Mitigation Measure NV-1 would be implemented but would not reduce outdoor noise impacts to less than significant levels at sensitive receptors; therefore noise impacts would remain significant and unavoidable for outdoor receptors during Copco 1 Dam deconstruction.**

Deconstruction activities at the Four Facilities could cause a temporary increase in nighttime noise levels at Iron Gate Dam. The predicted shift-period L_{eq} from the Iron Gate facilities removal is 91 dBA at 50 feet during both shifts (7:00 a.m. to 4:00 p.m. and 4:00 p.m. to 11:00 p.m.). The combination of existing noise, distance divergence, topographic attenuation, and atmospheric attenuation would result in a shift-period L_{eq} of 46 dBA during the daytime (7:00 a.m. to 10:00 p.m.) and 44 dBA during the nighttime (10:00 p.m. to 11:00 p.m.) at the nearest receptor. The estimated noise level at the receptor exceeds the significance criterion for nighttime noise. **Deconstruction noise**

would cause a temporary significant noise impact on the residential area near Iron Gate Dam at night. Mitigation Measure NV-1 would be implemented but would not reduce nighttime outdoor noise impacts to less than significant levels at sensitive receptors. Nighttime noise impacts would remain significant and unavoidable for outdoor receptors during Iron Gate nighttime deconstruction.

Reservoir restoration activities could result in short-term increases in noise levels in the project vicinity. Additional equipment, including hydroseeding barges, trucks, and helicopters, would be used for reservoir restoration at the same time as dam deconstruction. This reservoir restoration activity would add to the noise levels generated by dam deconstruction activities in and around the dam sites described above. Additionally residential areas along Copco Lake and Iron Gate Reservoir away from the dam deconstruction sites may experience temporary increased noise levels due to passing hydroseeding vessel, vehicle, or aircraft along the embankment. Aerial hydroseeding is scheduled to begin on March 15 and last for 10 days at Iron Gate and 20 days at Copco. The helicopter would make 30 trips per day between the hours of 7:30 a.m. and 7:00 p.m. All other hydroseeding would be accomplished by barges and trucks. **Helicopters and other equipment noise from embankment restoration would cause a temporary significant noise impact on the residential areas near Copco Lake and Iron Gate Reservoir and increase the significant noise levels generated by dam deconstruction in and around the dam sites. Mitigation Measure NV-1 would be implemented but would not reduce outdoor noise impacts to less than significant levels at these sensitive receptors.**

Blasting activities at Copco 1 Dam could increase vibration levels. Table 3.23-7 summarizes the Proposed Action's vibration levels at sensitive receptors. Because of blasting, during the first shift at Copco 1 Dam, the PPV and L_v at the nearest receptor are 0.065 in/sec and 84 VdB, respectively. For reference, vibration levels without blasting are shown in Table 3.23-7. The first shift at Copco 1 Dam would therefore exceed the significance criteria for L_v and this is because of the substantial amount of blasting required. During the second shift, the maximum PPV for this alternative would be 0.001 in/sec at the receptors and the L_v at the receptors would be approximately 48 VdB. The vibration levels from Iron Gate Dam and Copco 2 Dam or during the second shift from Copco 1 Dam would not exceed the significance criteria of 0.3 in/sec and 72 VdB. **Deconstruction activities would result in significant human annoyance levels for vibration impacts at receptors near Copco 1 Dam during blasting operations in the first shift. Mitigation Measure NV-1 would be implemented but would not reduce vibration impacts to less than significant levels; therefore, vibration impacts to humans would remain significant and unavoidable during blasting at Copco 1.**

Table 3.23-7. Summary of Vibration from Construction Activities for the Proposed Action

Source[1]	PPV at Receptor (in/sec)	L_v at Receptor (VdB)
Copco 1 Dam		
Shift 1	0.065 (0.002 without blasting)	**84** (53 without blasting)
Shift 2	0.001	47
Copco 2 Dam	0.001	48
Iron Gate Dam		
Shift 1	0.001	48
Shift 2	0.001	48

Source: FTA 2006.

Notes:

[1] J.C. Boyle was not analyzed because there are no receptors within 1 mile.

Key:

L_v = vibration velocity level

PPV = peak particle velocity

VdB = vibration decibels

in/sec = inches per second

Deconstruction-Related Traffic Noise

Transporting waste to off-site landfills and construction worker commutes could cause increases in noise along haul routes. Noise effects from transporting waste and construction worker commute were evaluated for receptors at 50 feet and 500 feet from the road. Table 3.23-8 shows the results of the TNM2.5 modeling for this potential impact. The TNM2.5 results showed only minor increases in existing L_{eq} for receptors 50 feet or more from all haul routes analyzed. Increases in traffic from construction worker commutes for the second shift at Copco 1 and Iron Gate would result in less noise impact than that presented in Table 3.23-8. **Transporting waste off-site and construction worker commutes would result in less than significant noise impacts for receptors 50 feet or more from all local roadways.**

Table 3.23-8. Summary of Construction-Related Traffic Noise from Off-site Hauling and Construction Worker Commute for the Proposed Action

Haul Route/Commute Segment	Peak 1-hour L_{eq} (dBA)		Increase in L_{eq} Caused by Proposed Action (dBA)[1]	
	50 ft	500 ft	50 ft	500 ft
Topsy Grade County Road	56	45	3	3
OR66	62	51	2	2
US97	76	64	0	0
I-5: Between OR66 and Medford, OR	77	66	0	0
Ager-Beswick Road	54	43	1	1
Copco Road	63	51	5	5
I-5: Between OR66 and Yreka, CA	77	66	0	0

Notes:

[1] The increase in L_{eq} may appear different when subtracting the existing 1-hour L_{eq} from peak 1-hour L_{eq} values due to rounding.

Key:

dBA = A-weighted decibels

L_{eq} = 1-hour equivalent noise level

ft = feet

Keno Transfer

The transfer of Keno dam to the United States Department of the Interior (DOI) could have adverse effects on noise and vibration. The Keno Transfer is a transfer of title for the Keno Facility from PacifiCorp to the DOI. This transfer would not result in the generation of new impacts on noise and vibration compared with existing facility operations. Following transfer of title, DOI would operate Keno in compliance with applicable law and would provide water levels upstream of Keno Dam for diversion and canal maintenance with agreements and historic practice (KHSA Section 7.5.4). **Therefore, the Keno Transfer would have no change from existing conditions for noise and vibration.**

East and West Side Facility Decommissioning

The decommissioning of the East and West Side Facilities could have adverse effects on Noise and Vibration. Decommissioning of the East and West Side canals and hydropower facilities of the Link River Dam by PacifiCorp as a part of the KHSA will redirect water flows currently diverted at Link River Dam in to the two canals, back into the Link River. The decommissioning and deconstruction activities could create noise and vibration in excess of applicable standards depending on the location of nearby sensitive receptors. Surveys of receptors and specific decommissioning activities will need to be completed prior to the decommissioning in order to prevent adverse impacts to sensitive receptors. **Therefore, the decommissioning of the East and West Side Facilities would have less than significant effects on noise and vibration.**

KBRA

The KBRA has several programs that could cause temporary increases in noise and vibration level. The following KBRA programs may cause some noise and vibration impacts from the use of heavy equipment:

- Phases I and II Fisheries Restoration Plans
- Fisheries Reintroduction and Management Plan
- Wood River Wetland Restoration
- On-Project Plan
- Water Use Retirement Program
- Fish Entrainment Reduction

Construction activities associated with the KBRA could cause temporary increases in noise and vibration levels. Construction activities associated with the above KBRA programs include channel construction, mechanical thinning of trees, road decommissioning, fish passage and facilities construction, breaching levees, and fish hauling. While the exact geographic location and timing of these programs is not known, it is assumed that some could occur at the same time and in the same area as the hydroelectric facility removal actions analyzed above and could contribute to the effects of facility removal on noise and vibration. **Due to the potentially large amount of construction activities that would occur for the various KBRA programs, it is**

anticipated that the effects from noise and vibration could be potentially significant on sensitive receptors. Mitigation Measure NV-1 would be expected to reduce noise and vibration impacts to less than significant levels; therefore, noise vibration impacts to humans would be expected to be reduced to a less than significant impact. Implementation of specific plans and projects described in the KBRA will require future environmental compliance as appropriate.

Operational activities associated with the Fisheries Reintroduction and Management Plan could result in temporary increases in noise and vibration levels from vehicles associated with trap-and-haul activities. Haul trucks relocating anadromous fish species around Keno Impoundment and Link River could produce noise and vibration. Seasonal trap and haul operations would occur at Keno Dam and Link River Dam during periods of poor water quality. Hauling activities would occur after the peak noise-generating period of facility removal because fish cannot access Keno Dam until after removal of the Four Facilities; however, some noise and vibration associated with completing removal activities and reservoir restoration may occur at the same time as hauling operations. Construction noise and vibration related to dam removal and hauling operations, taken together, could increase the severity of the effects, but the combined noise and vibration would likely still be less than the peak levels during dam deconstruction. The timing of these trap and haul operations from the hydroelectric facility removal actions analyzed above reduce the potential for any negative noise and vibration effects generated by these trap and haul actions from contributing to the effects of facility removal actions. **Although the exact extent and timing of these hauling activities is not known, it is anticipated that the effects from noise and vibration could be potentially significant on sensitive receptors. Mitigation Measure NV-1 would be expected to reduce noise and vibration impacts to less than significant levels; therefore, noise vibration impacts to humans would be expected to be reduced to a less than significant impact. Implementation of specific plans and projects described in the KBRA will require future environmental compliance as appropriate.**

Alternative 3: Partial Facilities Removal of Four Dams

Under this alternative, short-term demolition activities and drawdown of reservoirs would still occur; however, only in-stream facilities and select ancillary facilities would be demolished. Although there would be less total construction work and material hauling, peak day operations would be similar to those of the Proposed Action.

Deconstruction activities at the Four Facilities could increase noise and vibration levels. Noise and vibration impacts would be the same as for the Proposed Action and would be significant for construction noise and vibration impacts. **Mitigation Measure NV-1 would be implemented but would not reduce outdoor noise impacts to less than significant levels at sensitive receptors. Noise impacts would remain significant and unavoidable for outdoor receptors near Copco 1 and Iron Gate. Aircraft and other equipment noise from embankment restoration would cause a temporary significant noise impact on the residential areas near Copco Lake and Iron Gate Reservoir. Vibration impacts to humans would remain significant and unavoidable during blasting at Copco 1. Transporting waste to off-site landfills and construction**

worker commutes would result in a less than significant noise impact for receptors 50 feet or more from all local roadways.

Keno Transfer
The effects of the Keno Transfer would be the same as those for the Proposed Action.

East and West Side Facility Decommissioning
The effects of the East and West Side Facilities removal would be the same as those described for the Proposed Action.

KBRA
The Partial Facilities Removal Alternative would include full implementation of the KBRA. Therefore, impacts related to KBRA actions would be the same as under the Proposed Action, discussed above.

Alternative 4: Fish Passage at Four Dams
This section summarizes the potential noise and vibration impacts from constructing a fish passage at the Four Facilities. J.C. Boyle Dam was not analyzed for this alternative because there are no applicable sensitive receptors within a 1-mile radius. Copco 2 Dam was also not analyzed because the line of sight between the dam and the receptor is completely blocked by hills.

Construction Equipment Noise and Vibration
Construction activities at the Four Facilities could cause a temporary increase in noise levels at Copco 1 and Iron Gate receptor sites. Table 3.23-9 summarizes the predicted average 1-hour L_{eq} at each construction site and receptor, and the temporary increase in noise level at the receptor that would occur as a result of the Fish Passage at Four Dams Alternative. There are no long-term noise and vibration impacts due to this alternative.

Table 3.23-9. Summary of Noise Levels from Construction Activities for the Fish Passage at Four Dams Alternative

Location[1]	1-Hour L_{eq} (dBA)		
	At Construction Site (50 feet)	At Receptor with Fish Passage Construction	Increase in Existing L_{eq} Caused by Fish Passage Construction
Copco 1 Dam	90	52	**12**
Iron Gate Dam	90	45	5

Source: FHWA 2006.

Notes:

[1] J.C. Boyle was not analyzed because there are no receptors within 1 mile. Copco 2 Dam was not analyzed because the line of sight to the closest receptor is completely blocked.

Key:

dBA = A-weighted decibels

L_{eq} = 1-hour equivalent noise level

Fish passage construction activities could cause a temporary increase in noise levels at Copco 1 Dam. The predicted shift-period L_{eq} from construction activities at Copco 1 Dam is 90 dBA at 50 feet. Attenuation offered by distance, topography, and the

atmosphere would reduce this L_{eq} to approximately 52 dBA at the nearest receptor. The resulting increase in ambient noise levels at the receptor would be 12 dBA. **This increase in ambient noise levels would represent a significant noise impact on the residential area near Copco 1 Dam. Mitigation Measure NV-1 would be implemented but would not reduce outdoor noise impacts to less than significant levels at sensitive receptors. Noise impacts would remain significant and unavoidable for outdoor receptors during construction.**

Fish passage construction activities could cause a temporary increase in noise levels at Iron Gate Dam. The predicted shift period L_{eq} from construction activities at Iron Gate Dam is 90 dBA at 50 feet. Attenuation offered by distance, topography, and the atmosphere would reduce this 1-hour L_{eq} to approximately 45 dBA at the nearest receptor. The resulting increase in ambient noise levels at the receptor would be 5 dBA. **This increase in ambient noise levels would result in a less than significant noise impact on the residents near Iron Gate Dam.**

Construction activities could increase vibration levels. Table 3.23-10 summarizes vibration levels at the receptors for the Fish Passage at Four Dams Alternative. The maximum PPV for this alternative would be 0.003 in/sec at the receptor near Copco 1 Dam. The L_v at the receptors would range from 46 to 57 VdB for different vibration source locations; these vibration levels would not exceed the 0.3 in/sec and 72 VdB significance criteria. **Construction activities would result in less than significant vibration impacts.**

Table 3.23-10. Summary of Vibration Levels at Receptors from Construction Activities for the Fish Passage at Four Dams Alternative

Location[1]	Peak Particle Velocity (in/sec)	Vibration Velocity Level (VdB)
Copco 1 Dam	0.003	57
Copco 2 Dam	0.001	48
Iron Gate Dam	0.001	46

Source: FTA 2006.
Notes:
[1] J.C. Boyle was not analyzed because there are no receptors within 1 mile.
Key:
VdB = vibration decibels
in/sec = inches per second

Construction-Related Traffic

Transporting construction materials from off-site suppliers and construction worker commute could cause increases in noise along haul routes. The Lead Agencies evaluated the noise effects of transporting materials to the construction sites for receptors at 50 feet and 500 feet from the road. Table 3.23-11 shows the results of the TNM2.5 modeling for this potential impact. The TNM2.5 results showed only minor increases in existing L_{eq} for receptors 50 feet or more from all haul routes analyzed. **Transporting construction**

materials from off-site suppliers and construction worker commute would have a less than significant impact on receptors 50 feet or more from all local roadways.

Table 3.23-11. Summary of Construction-Related Traffic Noise from Off-site Hauling for the Fish Passage at Four Dams Alternative

Haul Route/Commute Segment	Peak 1-hour L_{eq} (dBA)		Increase in Existing L_{eq} Caused by Fish Passage Construction (dBA)[1]	
	50 ft	500 ft	50 ft	500 ft
Topsy Grade County Road	56	44	3	3
OR66	62	50	1	1
US97	76	64	0	0
I-5: Between Medford, OR and OR66	77	66	0	0
Ager-Beswick Road	54	43	3	3
Copco Road	60	49	2	2
I-5: Between OR66 and Yreka, CA	77	66	0	0

Notes:
[1] The increase in L_{eq} may appear different when subtracting the existing 1-hour L_{eq} from peak 1-hour L_{eq} values due to rounding.
Key:
dBA = A-weighted decibels
L_{eq} = existing 1-hour equivalent noise level
ft = feet

Trap and Haul – Programmatic Measure

Trap and Haul operations could result in temporary increases in noise and vibration levels from vehicles used to relocate fish. Haul trucks relocating anadromous fish species around Keno Impoundment and Link River could produce noise and vibration. Seasonal trap and haul operations would occur at Keno Dam and Link River Dam during periods of poor water quality. Although the exact extent and timing of these hauling activities is not known, it is anticipated that the **effects from noise and vibration could be potentially significant on sensitive receptors. Mitigation Measure NV-1 would be expected to reduce noise and vibration impacts to less than significant levels; therefore, noise vibration impacts to humans would be expected to be reduced to a less than significant impact. Implementation of specific plans and projects described in the KBRA will require future environmental compliance as appropriate.**

Alternative 5: Fish Passage at J.C. Boyle and Copco 2, Remove Copco 1 and Iron Gate Dams

This section summarizes the noise and vibration impacts that would be caused by constructing a fish passage at J.C. Boyle and Copco 2 Dams and removing the facilities at the Copco 1 and Iron Gate Dams. The analysis for this alternative does not predict construction impacts at J.C. Boyle Dam because there are no applicable receptors. Copco 2 Dam was also not analyzed for noise impacts because the line of sight between the dam and the receptor is completely blocked by hills.

Construction Equipment Noise and Vibration

Construction and deconstruction activities could cause a temporary increase in noise and vibration levels at receptor sites. Noise and vibration impacts at Copco 1 and Iron Gate Dams would be the same as for the Proposed Action. Vibration impacts near Copco 2 would be the same as for the Fish Passage at Four Dams Alternative. Increased noise and vibration levels would occur only during the construction/deconstruction period; no long-term noise and vibration impacts would occur. **Deconstruction at Copco 1 and Iron Gate Dams would have a temporary significant noise impact on outdoor receptors near the dam. Vibration impact to humans would be significant near Copco 1 Dam during blasting. Vibration impacts would be less than significant at receptors near Iron Gate and Copco 2 Dams. Aircraft and other equipment noise from embankment restoration would have a temporary significant noise impact on the residential areas near Copco and Iron Gate Reservoirs. Mitigation Measure NV-1 would be implemented but would not reduce outdoor noise and/or vibration impacts to less than significant levels at sensitive receptors near Copco 1 and Iron Gate Dams. Noise impacts would remain significant and unavoidable for outdoor receptors. Vibration impacts would also remain significant and unavoidable to humans near Copco 1.**

Construction-Related Traffic

Transporting waste to off-site landfills, hauling construction materials from off-site suppliers, and construction worker commute could cause increases in noise along haul routes. Noise impacts from haul trucks and worker commute were evaluated for receptors at 50 feet and 500 feet from the road. Table 3.23-12 shows the results of the TNM2.5 modeling for this alternative. The TNM2.5 results showed only minor increases in existing L_{eq} for receptors 50 feet or more from all haul routes analyzed. The second shift at Copco 1 and Iron Gate would not impact the roads in Oregon and would cause less impact on the California roads than what is presented in Table 3.23-12. **Transporting waste and construction materials and construction worker commute would have a less than significant impact on receptors 50 feet or more from all local roadways.**

Trap and Haul – Programmatic Measure

Trap and Haul operations could result in temporary increases in noise and vibration levels from vehicles used to relocate fish. The trap and haul measures around Keno Impoundment and Link River would have the same impacts under the Fish Passage at J.C. Boyle and Copco 2, Remove Copco 1 and Iron Gate Alternative as the Fish Passage at Four Dams Alternative. Although the exact extent and timing of these hauling activities is not known, it is anticipated that the **effects from noise and vibration could be potentially significant on sensitive receptors. Mitigation Measure NV-1 would be expected to reduce noise and vibration impacts to less than significant levels; therefore, noise vibration impacts to humans would be expected to be reduced to a less than significant impact. Implementation of specific plans and projects described in the KBRA will require future environmental compliance as appropriate.**

Table 3.23-12. Summary of Construction-Related Traffic Noise from Off-site Hauling for the Fish Passage at J.C. Boyle and Copco 2, Remove Copco 1 and Iron Gate Alternative

Haul Route/Commute Segment	Peak 1-hour L_{eq} (dBA)		Increase in Existing L_{eq} Caused by Fish Passage Construction or Facilities Removal (dBA)[1]	
	50 ft	500 ft	50 ft	500 ft
Topsy Grade County Road	56	44	3	3
OR66	62	50	1	1
US97	76	64	0	0
I-5: Between Medford, OR and OR66	77	66	0	0
Ager-Beswick Road	53	42	0	0
Copco Road	62	51	4	4
I-5: Between OR66 and Yreka, CA	77	66	0	0

Notes:
[1] The increase in L_{eq} may appear different when subtracting the existing 1-hour L_{eq} from peak 1-hour L_{eq} values due to rounding.
Key:
ft = feet
dBA = A-weighted decibels

3.23.5 Mitigation Measures

The following sections describe the recommended noise and vibration mitigation measures for each alternative.

Mitigation Measure by Consequences Summary

Mitigation Measure NV-1 – The Dam Removal Entity will develop a Noise and Vibration Control Plan (NVCP) to address increased day and night time noise levels as a result of the proposed project. The NVCP will identify the procedures for predicting construction noise levels at sensitive receptors prior to performing construction activities and will describe the reduction measures required to meet the target noise level. The NVCP will be based on planned construction activities. Noise and vibration mitigation measures will include, but will not be limited to the following:

- The Dam Removal Entity will ensure that the Construction Contractor is maintaining equipment to comply with noise standards (e.g., exhaust mufflers, acoustically attenuating shields, shrouds, or enclosures).
- For nighttime or after-hour construction, the Dam Removal Entity will coordinate with the local jurisdictions to minimize noise. Nearby residents will be notified of hours and duration of construction activities.
- Schedule truck loading, unloading, and hauling operations so as to reduce daytime and nighttime noise impacts to less than noticeable levels.
- The blasting schedule will be coordinated with local jurisdictions to minimize noise. Nearby residents will be notified of blasting schedules.

- Appropriate blasting techniques will be employed to minimize noise and vibration.
- Noise and vibration complaints will be addressed promptly and high impact activities rescheduled or alternate means of demolition and construction implemented, when feasible.

Effectiveness of Mitigation in Reducing Consequences

Implementation of mitigation measure NV-1 would manage noise and vibration impacts but would not reduce to less than significant levels. Because of the large construction areas and the long distances between the construction site and the receptors, conventional methods to reduce noise source, such as constructing barriers, would not provide a substantial reduction in noise levels and would not reduce noise and vibration to less than significant levels.

Agency Responsible for Mitigation Implementation

The Dam Removal Entity will be responsible for implementing mitigation measure NV-1.

Remaining Significant Impacts

Mitigation measures presented in Section 3.23.5 would not reduce noise impacts to less-than-significant levels for outdoor receptors. This is because of the very low existing noise levels at the receptor compared to the high noise levels at the construction site. However, actual existing daytime and nighttime ambient noise levels may be higher than those used in this analysis and construction noise levels may be lower and therefore the impact may be less. This analysis calculated outdoor noise levels at residential properties. A review of the parcel lots near each dam site indicated that the following parcels are located within a one-mile radius of each dam site, as shown in Figures 3.23-5 and 3.23-6, and may be affected by noise:

- Iron Gate: 40 parcels, excluding federal, county, and Pacific Power and Light Properties
- Copco 1 and 2: 135 parcels, excluding federal, county, and Pacific Power and Light Properties

It is not known at this time how many parcels would be occupied during construction and demolition activities; therefore it is assumed all parcels would contain residents and would be affected. The majority of parcels, however, are located farther from the construction sites than the peak sensitive receptor, so any potential impacts would be less than what was estimated for the peak receptor.

As described earlier, all calculated noise levels are for outdoor human receptors. Buildings with an open window would reduce the noise levels indoors by 10 dB. A light frame building with a closed ordinary sash would reduce the outdoor noise level by 20 dB. Depending on the building and window types, up to 35 dB reduction in indoor levels may be achieved (FHWA 2011), substantially reducing impacts for indoor receptors.

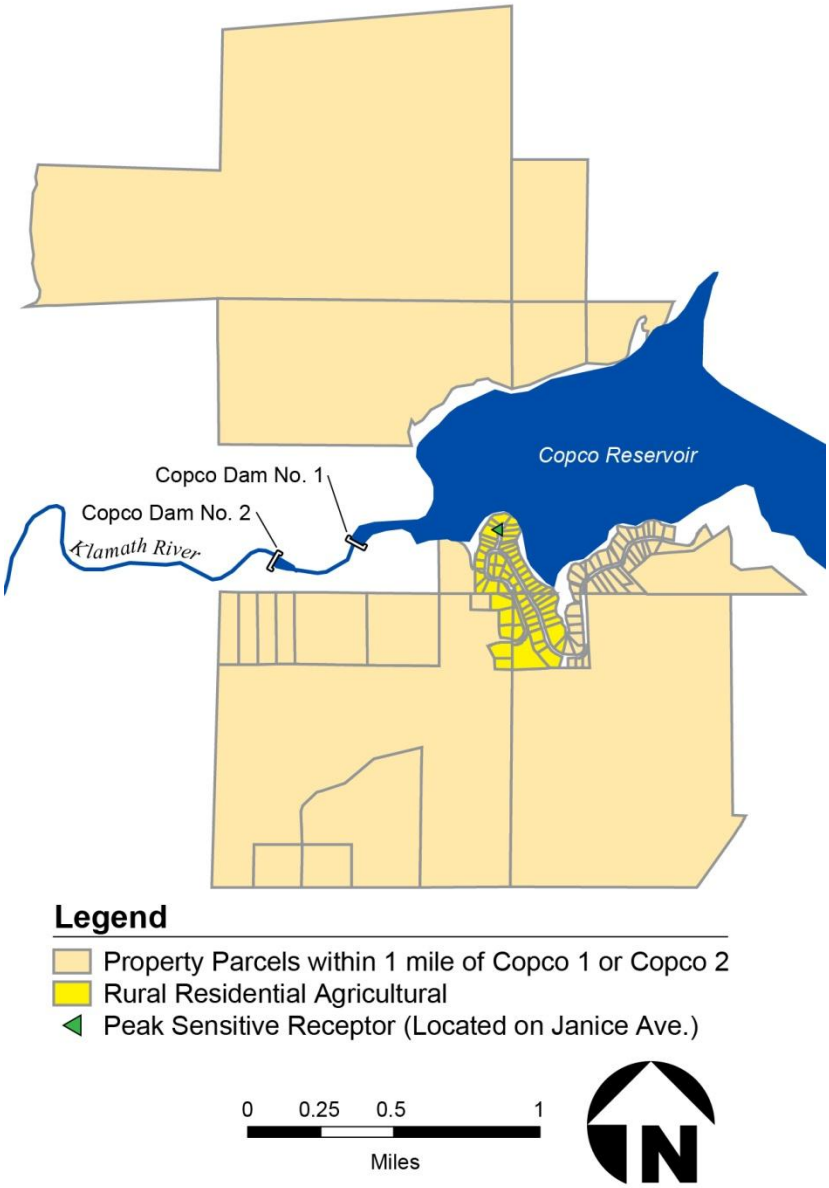

Figure 3.23-5. Parcel Lots within One-Mile of Iron Gate Dam

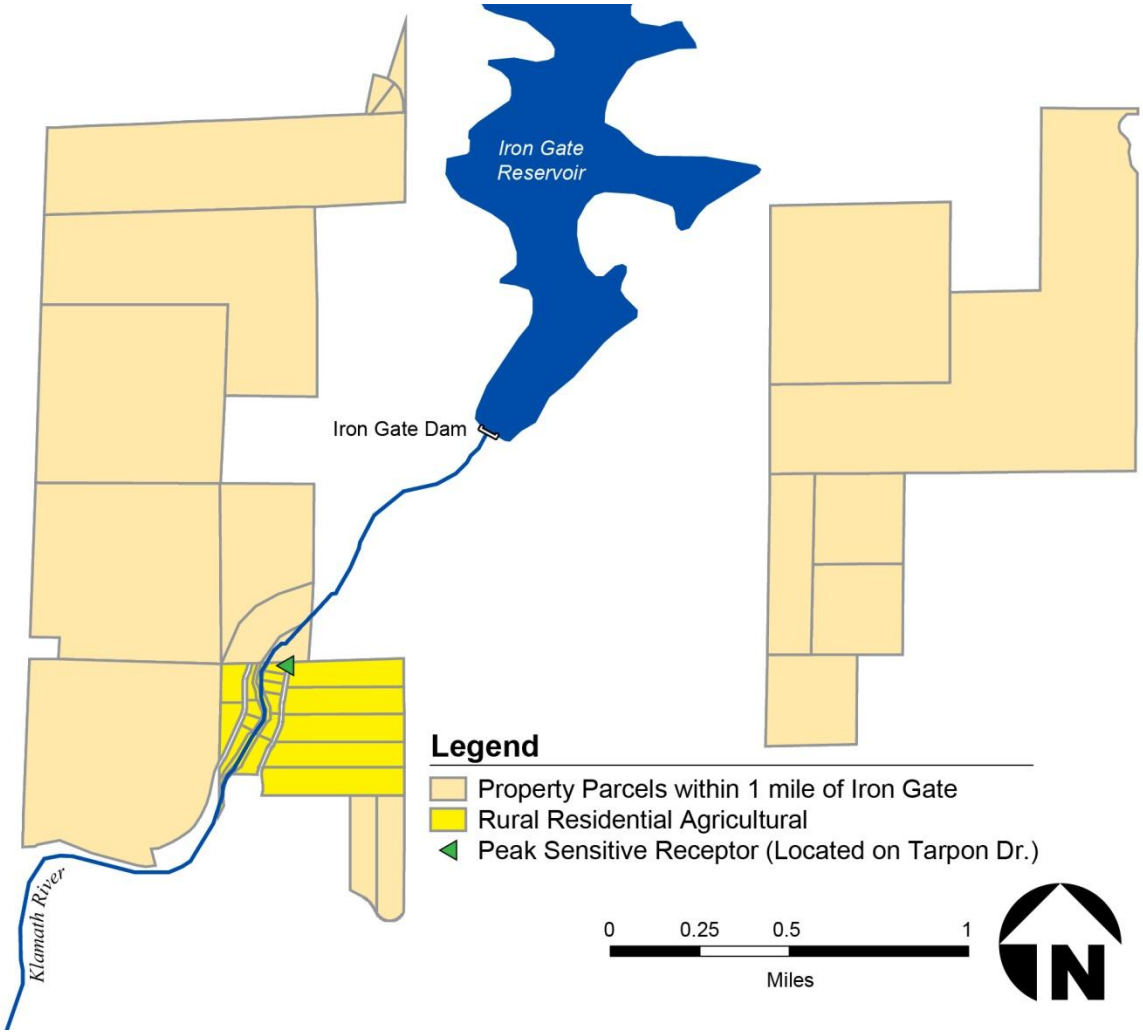

Figure 3.23-6. Parcel Lots within One-Mile of Copco 1 and 2 Dams

Mitigation Measures Associated with Other Resource Areas

Transporting fish and mollusks under Mitigation Measures AR-1, 2, 5-7 could cause temporary increases in traffic noise. These mitigation measures involve trap and haul of fish and mollusks to protect them from the reservoir drawdown and dam deconstruction activities. It is anticipated that as many as 150 truck trips may be required to transport juveniles from areas downstream of Iron Gate Dam to the confluence of Klamath and Trinity Rivers between February and April of 2020. On average, the traffic volume during peak construction times would increase by two trucks due this mitigation measure. As a rule of thumb, for traffic noise levels to increase significantly, hourly traffic volume must multiply by approximately a factor of 10. **The noise and vibration impacts of these measures would be less than significant.**

Construction activities under Mitigation Measure TR-1 could cause a temporary increase in noise and vibration levels. Relocation of Jenny Creek Bridge and culverts near Iron Gate Reservoir would occur before the other construction phases of dam removal. In comparison to the dam removal, equipment and time required for this construction would be minimal. No sensitive receptors were identified near the bridge and therefore, noise and vibration from construction would not impact human receptors. **Construction noise and vibration due to TR-1 would be less than significant.**

Construction activities under Mitigation Measure REC-1 could cause a temporary increase in noise and vibration levels. Mitigation REC-1 would create a plan to develop recreational facilities and access points along the newly formed river channel between J.C. Boyle Reservoir and Iron Gate Dam. Recreation facilities, such as campgrounds and boat ramps, currently located on the edge of the reservoir would need to be replaced in appropriate areas near the new river channel once the reservoir is removed. In comparison to the dam removal, equipment and time required for this construction would be minimal. Recreation facility replacement would occur following dam removal and would not generate noise levels that exceeds levels anticipated for the peak day. **Construction noise and vibration due to REC-1 would be less than significant.**

Several other mitigation measures may require construction, including mitigation measures H-2 (move or elevate structures with flood risk), GW-1 (deepen or replace wells), and WRWS-1 (modify water intakes). These measures could produce noise and vibration associated with construction activities. These activities would take place before or after the primary construction and deconstruction activities associated with the Proposed Action and action alternatives; therefore, they would not add to these noise and vibration impacts. The construction activities are generally smaller efforts that would not cause a substantial increase in noise to sensitive receptors. **Construction-related mitigation measures would cause a less than significant noise and vibration impact to sensitive receptors.**

3.23.6 References

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